Appendix C4 – Monitoring and Adaptive Management Plan

Lower Guadalupe Feasibility Study
(Guadalupe and Blanco Rivers), TX
Integrated Draft Feasibility Report and Environmental Assessment

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US Army Corps of Engineers®
Fort Worth District

Lower Guadalupe Feasibility Study: Monitoring and Adaptive Management Plan for the Bear Creek Detention Dam Alternative

The Lower Guadalupe Feasibility Study selected the No Action alternative as a result of comprehensive engineering, economic, cultural, and environmental investigations. As such, no environmental impacts will occur requiring habitat mitigation or associated monitoring and adaptive management.

This section outlines the feasibility level Monitoring and Adaptive Management Plan (MAMP) for the Lower Guadalupe Feasibility Study had the Bear Creek Detention Dam (BCDD) alternative been selected for implementation. This plan identifies and describes the monitoring and adaptive management activities proposed for the project and estimates their cost and duration. This plan would have been further developed in the Preconstruction, Engineering, and Design (PED) phase as specific design details are made available.

The Lower Guadalupe Feasibility Study MAMP describes and justifies if and when adaptive management is needed in relation to the mitigation features. The plan outlines how the results of the project-specific monitoring program would be used to adaptively manage the project, including specification of conditions that will define project success.

The primary intent of this MAMP is to develop monitoring and adaptive management actions appropriate for the project's mitigation goals and objectives. The presently identified mitigation actions permit estimation of the adaptive management program costs and duration for the Lower Guadalupe Feasibility Study. This plan is based on currently available data and information developed during plan formulation as part of the feasibility study.

Uncertainties remain regarding the exact project features, monitoring elements, and adaptive management opportunities. Components of the monitoring and adaptive management plan, including costs, were estimated using currently available information. Uncertainties will be addressed in PED, and a detailed MAMP, including cost breakdown, will be drafted by the project delivery team (PDT) as a component of the design document.

Authority and Purpose

The feasibility level MAMP was developed in accordance with the following guidance:

- USACE. 31 August 2009. Planning Memorandum. Implementation Guidance for Section 2039 of the Water Resources Development Act of 2007 (WRDA 2007) - Monitoring Ecosystem Restoration.
- USACE. 22 April 2000. ER 1105-2-100, Planning, Planning Guidance Notebook.
- USACE. 01 May 2003. EC 1105-2-404. Planning Civil Work Projects under the Environmental Operating Principles.

Project Goals and Objectives

The goal of the Lower Guadalupe Feasibility Study is to evaluate measures to reduce flood risk to life and property within the study area. All efforts to avoid and minimize impacts to natural areas and fish and wildlife communities were to be included where practicable. Unavoidable impacts to significant habitats, as defined in ER 1105-2-100, are to be mitigated in kind.

Flood Risk Management and Mitigation Plans

The PDT performed a thorough plan formulation process to identify potential flood risk management measures. Construction of the Bear Creek Detention Dam was analyzed for habitat impacts in the event it was identified as the Tentatively Selected Plan. The PDT subsequently identified, through resource agency coordination and habitat modeling, the most cost effective mitigation plan to offset the unavoidable, permanent loss of 1.3 acres of river and 7.3 acres of riparian forest. In addition, 21.3 acres of Federally endangered golden-cheeked warbler (GCWA) habitat would be permanently lost, as well as an additional 84 acres of GCWA habitat would be temporarily impacted during flood operations. To offset these impacts, the BCDD alternative included the following mitigation components:

- Obtain in fee and manage the detention area for the benefit of natural communities
- Remove Cummings Dam to existing grade level to restore riverine structure and function upstream and river reach connectivity downstream.
- Plant and manage up to 25 acres of riparian forest along the Guadalupe River near or downstream of New Braunfels, Texas.
- Acquire and manage up to 412 acres of GCWA habitat in Comal County in accordance with U.S. Fish and Wildlife Service's GCWA Management Plan.

Implementation

Pre-construction, during construction, and post construction monitoring shall be conducted by utilizing a Monitoring and Adaptive Management Team (MAMT) consisting of representatives from the U.S. Army Corps of Engineers (USACE), Comal County (project implementation sponsor), U.S Fish and Wildlife Service (USFWS), Texas Parks and Wildlife Department (TPWD), and contracted personnel (if needed).

Monitoring will focus on evaluating project success and guiding adaptive management actions by determining if the project has met performance standards. Validation monitoring will involve various degrees of quantitative monitoring aimed at verifying that restoration objectives have been achieved for both biological and physical resources. Effectiveness monitoring will be implemented to confirm that project construction elements perform as designed. Monitoring will be carried out until the project has been determined to be successful (performance standards have been met), as required by Section 2039 of WRDA 2007, ER 1105-2-100, and EC 1105-2-404. Adaptive management measures will be considered upon the first instance of failure to meet a performance standard (Table 1). Metrics and specific adaptive measure triggers will be refined during PED.

Table 1: Monitoring Criteria, Performance Standards, and Adaptive Management Strategies for the Bear Creek Detention Dam Alternative.

Measurement	Performance Standard	Adaptive Management
Cummings Dam removal	Annual inspection, and after any significant flooding in the San Marcos River to insure debris do not accumulate and recreate dam impacts	Remove debris. Excavate/flush accumulated sand, silt and debris to the downstream.
Riparian Plantings (herbaceous & woody)	80% plant establishment of native riparian species <25-percent canopy cover of non-native species with no area >0.25 acres in size with >25-percent non-native species <25-percent canopy cover of invasive species with no area >0.25 acres in size with >25-percent invasive species	Replacement of dead vegetation where appropriate; modify plant species composition or location within the mitigation area; modify propagation method, allowing natural succession of native vegetation; remedial planting/seeding; amending soil; modify irrigation, herbicide application, biological control; mechanical control of invasive species
GCWA Habitat	No developments within the property unless written approval from USACE and USFWS Austin ES Office. Monitor for encroachments and report to USACE and USFWS immediately. <25-percent canopy cover of invasive species with no area >0.25 acres in size	Invasive species management through chemical, biological, or mechanical control, manage oak wilt, management hunts of game and non-native species in accordance with TPWD rules and regulations, address encroachments immediately if they occur

	with >25-percent invasive species Manage game and invasive species through managed hunts	

Cummings Dam Removal Impacts
Mitigation success will be diminished dramatically if sediment or debris build up occurs. Mechanical removal would be the quickest method to remove any build ups. Roads to the site already exist, which would minimize the impact of heavy equipment use.

Riparian Plantings
Up to 25 acres of riparian forest would be planted as part of the mitigation efforts. Plantings can be impacted by non-native and invasive species, as well as climatic conditions. Monitoring is advised to ensure planting success by regular checkups. Any planted material that has died within the warranty period would be replaced. Post warranty period, the adaptive management plan would include the replacement of the plants, modification of the propagation method, and/or allow natural selection to augment the habitat. Restoration of riparian vegetation would be considered successful when the site meets the species diversity associated with the target vegetation association and when the site is generally vegetated with 80% success of plantings for woody species with an herbaceous canopy cover of at least 50 percent. Adaptive management could include remedial planting/seeding, modifying species composition, modifying propagation method, amending soil, and/or modifying irrigation to ensure successful establishment the vegetation.

Interim monitoring targets for the herbaceous component of the riparian plantings is 75-80 percent herbaceous cover in three years. After three years, tree plantings would decrease proportionately with the increase in shrub vegetation. Adaptive management would be initiated if the percent cover has not reached these criteria in three years and/or when the control of invasive herbaceous species is not achieved.

The establishment of tree species should be evaluated annually to ensure viability of seedlings. The establishment of volunteer shrubs, consistent with the proposed vegetation community being established, would be evaluated on an annual basis during the monitoring period to ensure the correct species composition of the restoration area is maintained. Adaptive management would be initiated in areas that fail to establish the density of trees with the percent species composition designed for the mitigation area.

GCWA Habitat
Coordination with USFWS should be continued to ensure compliance with USFWS standards. No developments would be allowed to occur within the mitigation area unless written approval is obtained from USACE and USFWS. Any encroachments

detected during annual inspections should be documented and reported to USACE and USFWS immediately. Invasive and game species abundances can be managed in accordance with TPWD rules and regulations. Adaptive management would be initiated in areas that fail to comply with acceptable standards.

Non-Native Vegetation & Invasive Species

The percent canopy cover of non-native and invasive species should be less than 25 percent at each restoration site. On an annual basis, or more frequently if needed, areas greater than or equal to 0.25 acres in size that have more than the 25 percent areal cover of non-native or invasive vegetation would be treated per the Operations and Maintenance Manual for the project which would be developed during PED. Typically, methods include chemical and mechanical management of non-native and invasive species.

Reporting

Evaluation of the success of the mitigation efforts for the Lower Guadalupe Feasibility Study will be assessed annually until all performance standards are met. Site assessments will be conducted annually by the MAMT and an annual report will be submitted to the USFWS, TPWD, Comal County, and other interested parties by January 30 following each monitoring year.

Permanent locations for photographic documentation will be established to provide a visual record of habitat development over time. The locations of photo points will be identified in the pre-construction monitoring report. Photographs taken at each photo point will be included in monitoring reports.

Monitoring and Adaptive Management Plan Costs

Costs to be incurred during PED and construction phases include drafting of the detailed MAMP. Cost calculations for post-construction monitoring are displayed for a three year monitoring period. It is intended that monitoring conducted under the Lower Guadalupe Feasibility Study will utilize a centralized data management, data analysis, and reporting functions associated with the USACE data management structure. All data collection activities will follow consistent and standardized processes established in the detailed MAMP. Cost estimates include monitoring equipment, photo point establishment, data collection, quality assurance/quality control, data analysis, assessment, and reporting for the proposed monitoring elements (Table 2). Unless otherwise noted, costs will begin at the onset of the PED phase and will be budgeted as construction costs.

Table 2: Cost Estimates for Implementation of the Monitoring and Adaptive Management Plan for the Lower Guadalupe Feasibility Study.

Category	Activities	PED Set-Up & Data Acquisition	Construction	3-year Post Construction	Total
Monitoring: Planning	Monitoring workgroup,	$10,000			$10,000

and Management	drafting detailed monitoring plan, working with PDT on performance measures				
Monitoring: Data Collection	Vegetation, Perimeter, and Dam assessments		$10,000	$25,000	$35,000
Data Analysis	Assessment of Monitoring Data and Performance Standards		$8,000	$5,000	$13,000
Adaptive Management Program	Detailed Adaptive Management Plan And Program Establishment and Management. Contingency for watering & re-planting, additional field work, etc			$100,000 $500,000	$100,000 $500,000
Database Management	Database development, management and maintenance			$5,000	$5,000
Total		$10,000	$18,000	$635,000	$663,000